

**University of Bahrain**  
**College of Information technology**  
**Department of Computer Engineering**

**Test (1)**

**Course Title:** Digital Logic

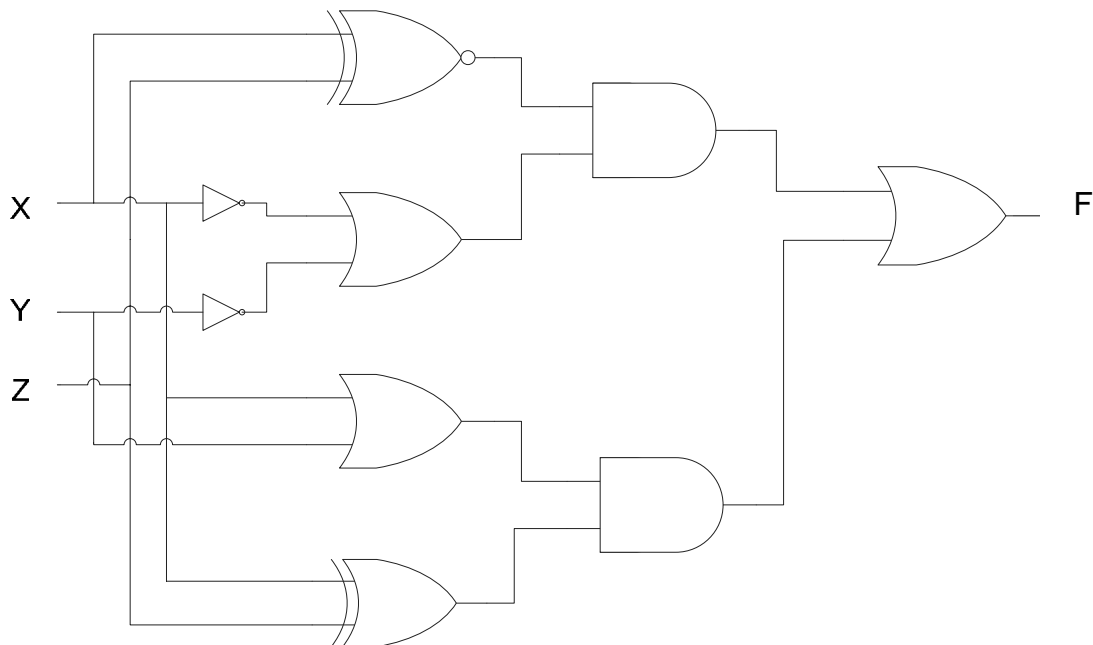
**Course number:** ITCE 202

**Semester:** 1

**Academic Year:** 2007/2008

**Duration :** 1 hour

**Question [1]:** For the circuit shown below:



(a) Find the output expression F

(b) Prove algebraically that the resultant output expression is equal to:

$$(X \oplus Y) + \bar{Z}$$

**Question [2] :**

(a) Convert the following numbers. Show the procedure used.

- $(01110.11)_2 = ( \quad )_{10}$
- $(231)_4 = ( \quad )_2$

- $(3E1.5)_{16} = ( \quad )_8$
- $(5)_{10} = ( \quad )_{6-2-2-1}$

(b) Divide in binary:

$$110000001 \div 1110$$

(c) For word length of 8 bit including sign:

- Represent the following decimal numbers:

Number	2's complement	1's complement
+7		
-7		
0		
-1		

- What is the largest positive number that can be represented in 2' complement notation using this word length?

(d) A and B are two 8-bit binary numbers represented in 2' complement as follows:

$$A = 01101011 \quad B = 10111101$$

Compute the value of  $(A - B)$  and indicate if overflow occurs.

**Question [3] :** Show how can you use two 4-bit parallel adder to implement  $(A + B)$  and  $(A - B)$ .

**Question [4] :** A combinational logic circuit has four inputs (A, B, C, D), which represent an 8-4-2-1 binary-coded-decimal digit. The output (W, X, Y, Z) represents the excess-3 of the inputs. The excess-3 code is obtained from the 8-4-2-1 code by adding 3. Assume only BCD digit occur as input.

- Construct the truth table.
- Find the minterm expansion of W in decimal notation.
- Find the maxterm expansion of X in decimal notation.

(e) Find the minimum SOP expression of Z.

**Question [5]** Realize the expression  $f$  using only 2-input NAND gates.

$$f(A, B, C, D) = \overline{A}B\overline{D} + \overline{A}CD + B\overline{C}D + \overline{B}CD$$

**Question [6]** Find the minimum sum of products for:

$$f(A, B, C, D) = \prod M(0, 2, 6, 7, 9, 12, 13) \bullet \prod D(1, 3, 5)$$